

$D_1(2420)^0$

$I(J^P) = \frac{1}{2}(1^+)$
/ needs confirmation.

$D_1(2420)^0$ MASS

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2421.4±0.6 OUR FIT	Error includes scale factor of 1.2. FIT Scale factor = 1.2]	[2421.3 ± 0.6 MeV OUR 2012		NODE=M097M
2421.1±0.7 OUR AVERAGE	Error includes scale factor of 1.2. 2012 AVERAGE Scale factor = 1.2]	[2420.9 ± 0.8 MeV OUR		NODE=M097M
2423.1±1.5 ^{+0.4} _{-1.0}	2.7k	¹ ABRAMOWICZ13 ZEUS	$e^\pm p \rightarrow D^{(*)} + \pi^- X$	
2420.1±0.1±0.8	103k	DEL-AMO-SA..10P BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
2426 ± 3 ± 1	151	ABE 05A BELL	$B^- \rightarrow D^0 \pi^+ \pi^- \pi^-$	
2421.4±1.5±0.9		² ABE 04D BELL	$B^- \rightarrow D^{*+} \pi^- \pi^-$	
2421 ± 1 ± 2	286	AVERY 94C CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
2422 ± 2 ± 2	51	FRABETTI 94B E687	$\gamma Be \rightarrow D^{*+} \pi^- X$	
2428 ± 3 ± 2	279	AVERY 90 CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
2414 ± 2 ± 5	171	ALBRECHT 89H ARG	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
2428 ± 8 ± 5	171	ANJOS 89C TPS	$\gamma N \rightarrow D^{*+} \pi^- X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2420.5±2.1±0.9	3110±340	³ CHEKANOV 09 ZEUS	$e^\pm p \rightarrow D^{*+} \pi^- X$	
2421.7±0.7±0.6	7.5k	ABULENCIA 06A CDF	$1900 p\bar{p} \rightarrow D^{*+} \pi^- X$	
2425 ± 3	235	⁴ ABREU 98M DLPH	$e^+ e^-$	

¹ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

² Fit includes the contribution from $D_1^{*(2430)}^0$.

³ Calculated using the mass difference $m(D_1^0) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV. The 0.17 MeV uncertainty of the PDG mass value should be added to the experimental uncertainty of 0.9 MeV.

⁴ No systematic error given.

NODE=M097M

NODE=M097M

NODE=M097M

NEW

NEW

NODE=M097M;LINKAGE=AR

NODE=M097M;LINKAGE=AB

NODE=M097M;LINKAGE=CH

NODE=M097M;LINKAGE=K

NODE=M097DM

NODE=M097DM

NODE=M097DM

NEW

NODE=M097W

NODE=M097W

NEW

$D_1(2420)^0$ WIDTH

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
411.1±0.6 OUR FIT	Error includes scale factor of 1.2. Scale factor = 1.2]	[411.0 ± 0.6 OUR 2012 FIT		
411.5±0.8 OUR AVERAGE				
410.2±2.1±0.9	3110±340	CHEKANOV 09 ZEUS	$e^\pm p \rightarrow D^{*+} \pi^- X$	
411.7±0.7±0.4	7.5k	ABULENCIA 06A CDF	$1900 p\bar{p} \rightarrow D^{*+} \pi^- X$	

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
27.4± 2.5 OUR AVERAGE	Error includes scale factor of 2.3. See the ideogram below. [27.1 ± 2.7 MeV OUR 2012 AVERAGE Scale factor = 2.4]			
38.8 ± 5.0 ^{+1.9} _{-5.4}	2.7k	⁵ ABRAMOWICZ13 ZEUS	$e^\pm p \rightarrow D^{(*)} + \pi^- X$	
31.4 ± 0.5 ± 1.3	103k	DEL-AMO-SA..10P BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
20.0 ± 1.7 ± 1.3	7.5k	ABULENCIA 06A CDF	$1900 p\bar{p} \rightarrow D^{*+} \pi^- X$	
24 ± 7 ± 8	151	ABE 05A BELL	$B^- \rightarrow D^0 \pi^+ \pi^- \pi^-$	
23.7 ± 2.7 ± 4.0		⁶ ABE 04D BELL	$B^- \rightarrow D^{*+} \pi^- \pi^-$	
20 ± 6 ± 3	286	AVERY 94C CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
15 ± 8 ± 4	51	FRABETTI 94B E687	$\gamma Be \rightarrow D^{*+} \pi^- X$	
23 ± 8 ± 10	279	AVERY 90 CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
13 ± 6 ± 10	171	ALBRECHT 89H ARG	$e^+ e^- \rightarrow D^{*+} \pi^- X$	

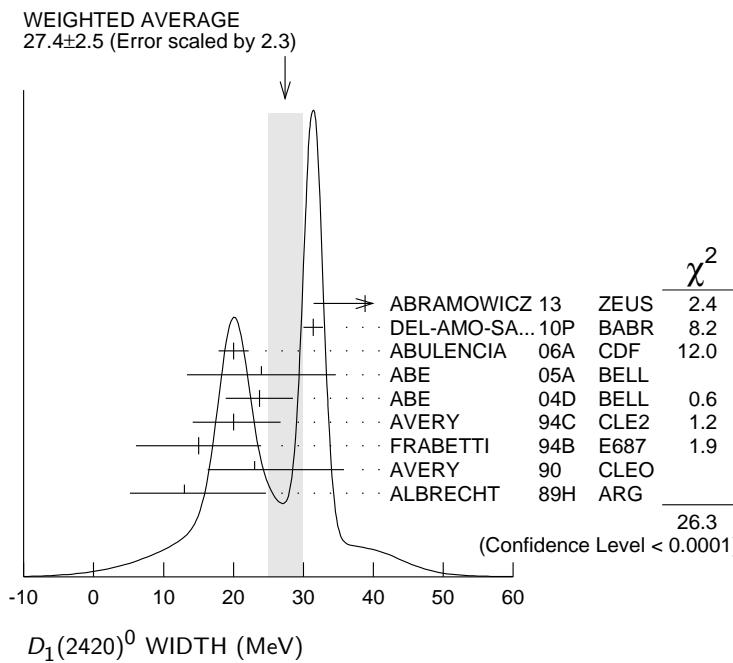
• • • We do not use the following data for averages, fits, limits, etc. • • •

$53.2 \pm 7.2^{+3.3}_{-4.9} \quad 3110 \pm 340$ CHEKANOV 09 ZEUS $e^{\pm} p \rightarrow D^{*+} \pi^- X$

$58 \pm 14 \pm 10$ 171 ANJOS 89C TPS $\gamma N \rightarrow D^{*+} \pi^- X$

5 From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

6 Fit includes the contribution from $D_1^*(2430)^0$.



$D_1(2420)^0$ DECAY MODES

$\bar{D}_1(2420)^0$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^*(2010)^+ \pi^-$	seen
$\Gamma_2 D^0 \pi^+ \pi^-$	seen
$\Gamma_3 D^0 \rho^0$	
$\Gamma_4 D^0 f_0(500)$	
$\Gamma_5 D_0^*(2400)^+ \pi^-$	
$\Gamma_6 D^+ \pi^-$	not seen
$\Gamma_7 D^{*0} \pi^+ \pi^-$	not seen

$D_1(2420)^0$ BRANCHING RATIOS

$\Gamma(D^*(2010)^+ \pi^-)/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	ACKERSTAFF 97W OPAL $e^+ e^- \rightarrow D^{*+} \pi^- X$
seen	AVERY 90 CLEO $e^+ e^- \rightarrow D^{*+} \pi^- X$
seen	ALBRECHT 89H ARG $e^+ e^- \rightarrow D^* \pi^- X$
seen	ANJOS 89C TPS $\gamma N \rightarrow D^{*+} \pi^- X$

$\Gamma(D^+ \pi^-)/\Gamma(D^*(2010)^+ \pi^-)$	Γ_6/Γ_1
<u>VALUE</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.24 90	AVERY 90 CLEO $e^+ e^- \rightarrow D^+ \pi^- X$

$D_1(2420)^0$ POLARIZATION AMPLITUDE A_{D_1}

A polarization amplitude A_{D_1} is a parameter that depends on the initial polarization of the D_1 and is sensitive to a possible S-wave contribution to its decay. For D_1 decays the helicity angle, θ_h , distribution varies like $1 + A_{D_1} \cos^2 \theta_h$, where θ_h is the angle in the D^* rest frame between the two pions emitted by the $D_1 \rightarrow D^* \pi$ and the $D^* \rightarrow D \pi$.

NODE=M097W;LINKAGE=AR

NODE=M097W;LINKAGE=AB

NODE=M097215;NODE=M097

NODE=M097

DESIG=1

DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=4

DESIG=5

DESIG=6

DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=7;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M097220

NODE=M097R1

NODE=M097R1

NODE=M097R2

NODE=M097R2

NODE=M097PAH

NODE=M097PAH

Unpolarized D_1 decaying purely via D -wave is predicted to give $A_{D_1} = 3$.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		<u>NODE=M097PAH</u>
5.73±0.25 OUR AVERAGE						NEW
[5.72 ± 0.25 OUR 2012 AVERAGE]						
7.8 $+6.7$ -2.7 $+4.6$ -1.8	2.7k	⁷ ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)} + \pi^- X$		
5.72 ± 0.25	103k	DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$		
5.9 $+3.0$ -1.7 $+2.4$ -1.0		CHEKANOV 09	ZEUS	$e^\pm p \rightarrow D^{*+} \pi^- X$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
3.8 ± 0.6 ± 0.8		⁸ AUBERT	09Y BABR	$B^+ \rightarrow D_1^0 \ell^+ \nu_\ell$		
$2.74^{+1.40}_{-0.93}$		⁹ Avery	94C CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$		
⁷ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1 . A pure D -wave not excluded although some S -wave mixing possible.						
⁸ Assuming $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$ and equal partial widths and helicity angle distributions for charged and neutral D_1 mesons.						
⁹ Systematic uncertainties not estimated.						
<hr/>						
$D_1(2420)^0$ REFERENCES						
ABRAMOWICZ 13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)			
DEL-AMO-SA... 10P	PR D82 111101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)			
AUBERT 09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)			
CHEKANOV 09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)			
ABULENCIA 06A	PR D73 051104	A. Abulencia <i>et al.</i>	(CDF Collab.)			
ABE 05A	PRL 94 221805	K. Abe <i>et al.</i>	(BELLE Collab.)			
ABE 04D	PR D69 112002	K. Abe <i>et al.</i>	(BELLE Collab.)			
ABREU 98M	PL B426 231	P. Abreu <i>et al.</i>	(DELPHI Collab.)			
ACKERSTAFF 97W	ZPHY C76 425	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)			
AVERY 94C	PL B331 236	P. Avery <i>et al.</i>	(CLEO Collab.)			
FRABETTI 94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)			
AVERY 90	PR D41 774	P. Avery, D. Besson	(CLEO Collab.)			
ALBRECHT 89H	PL B232 398	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	JP		
ANJOS 89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)			
<hr/>						
					REFID=54743	
					REFID=53534	
					REFID=52929	
					REFID=52733	
					REFID=51054	
					REFID=50755	
					REFID=50011	
					REFID=46315	
					REFID=45788	
					REFID=44096	
					REFID=43687	
					REFID=41013	
					REFID=41001	
					REFID=40737	